

# **3-D Numerical Simulations of Colliding Winds in eta Carinae and WR 140**

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We report on the results from 3-D SPH (Smoothed Particle Hydrodynamics) simulations of colliding winds in the supermassive binary  $\eta$  Carinae and the proto-typical Wolf-Rayet binary WR 140. For simplicity, both winds are assumed to be either isothermal or adiabatic, and a simplified radiation force on the wind particles is adopted. Our simulations show that in  $\eta$  Car the lower density, faster wind from the secondary carves out a spiral cavity in the higher density, slower wind from the primary, whereas in WR 140 it is the lower density, primary (an O4-5V star) wind that carves out a spiral cavity in the denser wind from the secondary (a WC9 star). Because of their very-high orbital eccentricities, both systems show a similar, asymmetric shape of interaction surface: the cavity is very thin on the periastron side, whereas it occupies a large volume on the apastron side. A closer look, however, reveals differences caused by the differences in the wind momentum ratio and the speed of the slower wind: the interaction cone is wider and the spiral structure is more tightly wound in  $\eta$  Car than in WR 140. These differences are likely to affect the observational appearances of these interesting binaries.